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THE ELECTRIC AUTOMOBILE - A DISCUSSION OF STRATEGY, TACTICS, AND LEADERSHIP 6

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ABSTRACT

The development of an electrically powered vehicle is likely to affect a substantial portion of our economy. The stakes involved are high, and it is clear that activities related to the electric auto are increasing exponentially.

A grave danger exists that this sudden frenzied activity may cause grave harm and waste unless it is channeled in the right direction.

This paper is concerned with an analysis of the interplay between national segments which are most concerned.

1. The federal government - as representing the public
2. The automobile manufacturers
3. The electric power sources developers
4. The space agencies concerned with technological "spin-off"
5. The academic community
6. The Regional and City planners
7. The Labor Unions
8. The Petroleum Industry

This paper explores the logical sources of leadership, and attempts to define the required strategy and tactics which may help to minimize wasted resources, and which may help to maximize the potential benefits of this technological advance.

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Text

A truly impressive number of speeches, papers, press releases, and broadcasts have recently flooded the nation, all devoted to the "Electric Automobile." I feel apologetic about my own contributions in the further generation of paperwork, and for that reason I will be as brief as possible.

The technical aspects which are fundamental to the electric auto are covered in sufficient detail elsewhere, and a repetition of these would be redundant here. If I may anticipate the results of the technical presentations to follow, it appears possible to characterize the technical state of the art as follows.

1. The only electric vehicle which could be mass produced immediately would be

- a. Powered by lead-acid batteries
- b. Small
- c. Light
- d. Unsafe in an environment of cars with more weight and performance
- e. Unacceptable to the majority of Americans
- f. A nuisance in the city and on highways

2. Expected advances in batteries will almost certainly be able to provide such vehicles with a much greater range within perhaps two years from now.

3. Power sources capable of competing with the Otto engine are probably ten years away from practicality.

I believe that even the most avid proponents of the electric auto - and I am one of them - will agree with the above statements.

In all honesty, then, one must conclude that the time-honored way of introducing technological changes in this country would preclude a change to the electric automobile, i.e. the vehicle would not be cheaper nor more comfortable than the present automobile, nor would it perform better.

It is, therefore, important to face the fact that the only incentive for electric automotive propulsion is the presence of the very real problem of pollution. Primarily, then, the existing need is for the elimination of air pollution, and not for the electric auto - unless it turns out that the electric auto is indeed the optimal solution to this basic problem.

At this point, then, we can proceed with an analysis of the interplay among the important segments of the nation which are involved.

The Federal Government

The primary motivating force is the urgency to do something about air pollution. A less well-known motivating force is the pressing need to alleviate vehicular congestion in the cities. We will return to this second point later.

Two bills are before congress now, and others are bound to follow, which would authorize sizable expenditures in the area of electric vehicular propulsion. The Department of Commerce has organized a Panel for purposes of advising the Government on the Electric Auto. It may be anticipated that significant sums will be authorized and spent.

Two major questions arise which need answers.

1. Is the timing right to pump money into this development?
2. What activities should be funded?

The strategy and tactics which I would recommend at this time are as follows.

It would appear from what was said above, that the Government's concern ought to be with any solution to vehicular air-pollution and urban congestion, not just the electric auto.

It seems obvious, at first, that all effort should be made to encourage the modification of internal combustion engines to reduce pollutants to an acceptable minimum. Similar arguments apply to the fuel. Why commit the nation to a revolutionized vehicle and the concomitant related industries before all avenues to emission limited vehicles have been explored?

Strangely enough, it appears that the appropriate strategy for the Government might be that of supporting work on the electric auto. Without being unduly cynical it can be stated that every dollar which has been spent on electric propulsion research has been accompanied by a (probably) ten dollar expenditure by the automobile industry to develop emission limited vehicles.

It is probably futile to argue the "cause and effect" relationship. In any event, it seems clear to me that American industry becomes most productive and ingenious when faced with a threat to its vested interests.

At the present time the proponents of the electric auto are weak. I would, therefore, recommend to our government that it can accomplish its ultimate aims best by indeed stimulating research and systems studies on electric vehicles. If adequate vehicles, competitive with ICE's, can be developed - good. If this activity spurs progress on the development of emission limited ICE's - also good. The appropriate strategy, then, would be as described above.

Tactical considerations would suggest that grants should be distributed as follows.

1. In the area of urban planning to determine the possible usefulness of "First Generation" electric autos.
2. To Universities to build up needed capabilities in basic electro-chemistry and electrochemical engineering.
3. To battery manufacturers, to increase their R & D capabilities. The patent situation is a serious one here, and will be examined later.
4. To Government Laboratories to establish an equivalent of NASA, i.e. a National Automotive and Transport Administration. The primary goal of such an organization ought to be the conduct of research and the gathering of engineering data of use to the private sector of the automotive and transport industry.

The Automobile Manufacturers

The position of this segment of the economy is an uncomfortable one. In the past, Detroit has given the public superb service and has literally been able to provide wheels for anyone who wanted them. Today, Detroit finds itself very much on the defensive in two major areas, namely "Safety" and "Air Pollution". In my opinion the blame for this situation should be shared by two parties, namely the automotive industry as well as the Government. When the air pollution problem was recognized, the automotive industry should have been forthright enough to state flatly that their responsibility ended with the mass production of vehicles which could meet standards of acceptance by the purchaser, safety standards and emission standards as determined by public interests, and as expressed by Government. In turn, Government should have faced up to the fact that Detroit's expertise is in engineering and production - and not in sociology. It appears quite clear to me that the correct strategy on the part of the automotive industry must be as follows.

1. A clear and succinct statement to the effect that the Industry is ready to provide engineering solutions which meet standards and specifications set by Government.
2. A willingness to provide data on the cost of meeting such specifications, and the time required.
3. A strong statement to the effect that the Industry is not equipped to make the requisite value judgements in selecting a set of specifications, and furthermore, that the Industry cannot in good conscience be asked to make them.

In my opinion, the unwillingness of automotive spokesmen to make the above statements has hurt the Industry needlessly.

Another area where strategy on the part of the automotive industry is involved is in the recognition that transportation habits in the urban-suburban environment are probably due for a substantial change. There are several factors which, when combined, are a clear signal along these lines.

1. Increasing complexity of the power plant, particularly with the need to adjust engines for minimum emissions, requires an ever-increasing amount of attention.
2. The increasing shortage of skilled mechanics, and the increasingly indifferent attitude of dealers and garages make it more and more difficult to obtain service at a reasonable expenditure of time and money.
3. Car rentals and leasing is becoming more and more popular.
4. Garaging of private autos in big cities is rapidly becoming prohibitively expensive, in terms of money and space.
5. Mass transportation media into city terminals are improving, but still fail to appeal to many commuters.

These five factors combine to lead to some far reaching conclusions.

1. An examination of why more people do not use mass transit systems into cities is most likely due to the bottleneck which exists at the terminal. To change to buses or subways, to have to wait, and to still have to walk, is more than people are willing to do. The need to open up this bottleneck will undoubtedly lead to innovation and business opportunities, which the automotive industry should examine carefully. It appears to me that a need exists to provide the commuter with a service which falls between the taxi and the bus or subway.

This need could be met by the introduction of small, inexpensive, drive yourself vehicles. These vehicles could be formed into "Elephant" trains, so as to make their collection and redistribution possible during the course of a day, thus enabling several people to share the same vehicle. If one examines the five points listed above, then it is seen that such a "System" could indeed meet a need in an economical fashion as far as the commuter is concerned. It is equally clear that an extension of such a "System" to suburban locations would also make sense.

The implications of such a development for the automotive industry are equally clear. Fewer families would buy second cars, but the public would be served better, and a market would exist for a completely new type of vehicle.

2. Several points in connection with the above must now be made.

- a. The small vehicles discussed above are within the state of the art of electric propulsion.
- b. Future improvements in power sources would give these vehicles greater range, and even acceptability as a privately owned suburban "Towne Car".
- c. They would logically lead into the progression described in the beginning of this paper.
- d. The biggest problem would be the inherent "Non-Safety" of these vehicles in proximity to bigger and more powerful cars.

Now to strategy and tactics. The automotive industry should adopt the following attitude.

1. City planners should be told in no uncertain terms that such vehicles can indeed be produced within the next three to five years.

2. It is the responsibility of the city planners to provide a safe environment for these cars, and to write the needed "City Specifications". The city planners have to wrestle with the problems of routing, city ordinances, possible transshipping terminals for goods, etc.

3. The financial risks involved in such a venture, with public acceptance as the big unknown, cannot be assumed by the automotive industry.

4. The most useful contribution of Government would be a program of large-scale experimentation along the lines described, as a part of the general "Demonstration Cities" activity.

Again, I believe that such a forthright posture would end up being in the Industry's favor.

The Electric Power Sources Industry

This segment of Industry is concerned with the production of batteries and, eventually fuel cells.

The Industry has just passed through a very satisfactory transition period which has provided it with good R & D capability. This transition was brought about primarily by the demands of our Space Activities.

This Industry faces some peculiar problems in the area of automotive applications. Its primary capability is in the production of power sources, and it is logical to recognize its aspirations to become suppliers of the power sub-system to the automotive industry. This, however, is counter to the tradition of the automotive industry which likes to manufacture "Everything".

Strategy is very difficult to formulate for this segment. Even so, it is possible to list the various options available.

The first, and most direct one, consists of establishing a strong proprietary or patent position. Experience in the Space Power area suggests, however, that this is a very difficult thing to do in the face of massive governmental expenditures for R & D. This would suggest that money spent by battery manufacturers in R & D should be in inverse proportion to governmental expenditures; i.e. if it becomes clear - and it will within the next year - that the federal government is indeed going to spend millions of dollars on the electric auto, then this would make the investment of private capital for R & D very unattractive. Any significant increase in research activity on the part of battery manufacturers at this particular time is very risky, but significant achievements may well be capable of eliminating the need for massive governmental expenditures. This Industry has to determine the likelihood of such achievements within the next year.

The second option involves the pooling of talents between the battery manufacturers and the giants of the Electric Industry such as General Electric or Westinghouse. It is conceivable that a market could exist for first generation electric vehicles which may be enough to be attractive to a new "Combine" but which may not be big enough to attract the giants of the automotive industry. This market could well go to such a "Combine" by default of the automotive industry.

The third option involves the absorption of battery manufacturers by the automotive industry. The announced Ford-Yardney cooperation is a case in point. From the point of view of the shareholder it is doubtful that this course of action has much to recommend it.

The Space Agency

There exists an acknowledged self-interest on the part of NASA to promote technological "Spin-offs".

The use of electric power sources for automobiles would be the first major terrestrial application of Space Technology. It is true that few of the electric power sources which were developed for space are suitable for automobiles. On the other hand, the stimulus to the technology and the production of electrochemical capability has had a major effect, for which the Space Agency can claim credit.

In terms of strategy, it may well be desirable for NASA to sponsor work on electric power sources both "In house" and elsewhere, even if Space Applications are not the specifically aimed for objective.

The Academic Community

The law of supply and demand has so far limited our production of electrochemists. Electrochemical engineering is such a new option, that to the best of my knowledge the University of Pennsylvania is the only one in the country where such an educational program is being offered.

In terms of strategy, it appears to me that Universities are in a unique position to contribute to the overall program of electric vehicular propulsion. They might offer themselves as logical places in which to locate research centers devoted to electrochemistry and electrochemical technology. The usefulness of establishing centers for the generation of knowledge where they could contribute to the generation of Ph.D.'s in science and engineering is a demonstrated successful concept. I hasten to add that electric vehicular propulsion is an important part of electrochemical engineering, but only a part! Electrochemical synthesis, corrosion and other problems are among the many which also require attention.

The Regional and City Planners

The proverbial shoe pinches hardest in the city. It is in the urban environment where pollution and congestion reach their ugly pinnacle. When this is coupled with the fact that the first generation of electric autos (or emission-limited vehicles) will be most applicable in the city, then clearly it must be agreed that the city planners have a major role to play.

In terms of strategy, it is a clear-cut case for early planning. The advent of a small, semi-public vehicle, as described above, offers them an additional option to be fitted into the overall city transportation scheme. In terms of tactics, it is imperative that an immediate link be formed between the city planners, the transportation engineers, and the automotive manufacturers.

The Labor Unions

Any technological upheaval is bound to cause unrest among the "working" people who expect to be affected. The labor segments who are involved in a transition of the type anticipated here are, as a minimum, the workers in the automotive industry, i.e. the mechanics, the taxi drivers and the truck drivers.

In terms of strategy it appears desirable to take "Labor" in as a partner in "Planning", and to do so at a very early stage.

It would be utter stupidity to have political pressure brought to bear on City Councils or Mayors to prevent the introduction of fleet vehicles, for instance, just because somebody forgot to tell the taxi drivers that their services will be needed to collect and redistribute the vehicles, as a typical example.

I would use this example to make a more general case. A "planned" economy is not acceptable in this country. A planned for economy, however, is. The tools of bringing technological advances about in an "optimal" fashion in the United States environment has not yet been completely solved or optimized. The probable transition to electric power sources for automobiles is an important enough step to make it attractive and desirable to develop new tools in sociological engineering.

The Petroleum Companies

It is obvious that the advent of the electric auto would have serious repercussions on this Industry. It should be recognized that the petroleum industry has scientific and technological depths which are impressive. I would vote them as the "Industry most likely to come up with a clean I.C.E.". It may be expected that very good contributions will be forthcoming from that direction, some of which are,

1. The removal of lead as an additive
2. Actual I.C.E. developments incorporating emission limiting devices.
3. Information on details of air pollution

The question is not so much as to whether significant technical advances will be made, but rather as to will they come about soon enough, and will the cost of emission reduction in dollars and in engine performance be acceptable.

If it turns out that emission limited (standards to be set by Government) engines cost a great deal, and that the emission specifications can be met only at a cost of appreciable performance degradation, then the competition of electric autos will have to be faced.

The called for strategy, then, must be a massive investment in short term research and development. A significant development today is worth ten major developments two years from now. The burden of proof is on this Industry to demonstrate that the I.C.E. is here to stay. As of today, I have not seen any convincing data. Expressions of optimism are not enough. Convincing evidence has yet to be shown.

Closure

The problems and opportunities in connection with the electric auto have been enumerated.

It is hoped that an enumeration of motivations and suggested strategy will be helpful in bringing about a more enlightened climate in which all interested parties can work.

Forthright leadership in the way of qualified spokesmen for the parties involved is badly needed.

Finally, this author recognizes his limitations, and his demonstrated ability to be wrong (at times), and will not be unhappy if he is taken to task for jumping to unwarranted conclusions. He only hopes that such corrections will also tend to clear the air, and will convert noise (appreciable) into clear signals.